IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant:	Won-Sung Choi	)
		) Group Art Unit:
Application No:	09/726,977	) 1734
		)
Filed:	November 30-2000	) Examiner:
		) Kackar, Ram N.
For:	THIN FILM DEPOSITION APPARATUS FOR SEMICONDUCTOR	)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

1. REAL PARTY IN INTEREST

The real party in interest in this Appeal is the Assignee, IPS Ltd.

2. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known at this time to the Appellant, or the Appellant's legal representatives which will directly affect, or be directly affected by, or have a bearing upon the Board's decision in this appeal.

3. STATUS OF CLAIMS

Claims 1, 2, 6–14 and 17–19 are pending in the application. Of those, claims 1, 2, 6–10, 12–14, 17 and 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie (U.S. Patent No. 5,928,428) in view of Limb et al. (U.S. Patent No. 5,352,615) and further in view of Tanaka (U.S. Patent No. 5,091,207) and Nozawa et al. (U.S. Patent No. 5,290,381). Claims 11 and 19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Limb et al., Tanaka and Nozawa et al. and further in view of Nishikawa et al. (U.S. Patent No. 5,470,390).

The final rejection of claims 1, 2, 6–14 and 17–19 is appealed.

4. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final Office action of June 9, 2003. A copy of the appealed claims is provided in an Appendix attached hereto.

5. SUMMARY OF INVENTION

The following is a concise explanation of the invention. Reference to the specification and drawings is made pursuant to 37 CFR 1.192 and is not intended to limit the claims to the embodiments shown and described in the application.

The invention relates to an apparatus of performing a thin film deposition process and a thermal treatment on a wafer using ozone. (Page 3, lines 2–8). The apparatus includes a gas supply portion 400 and an ozone supply portion 300 for providing reaction gas and ozone, respectively, to a reactor 100 in which a wafer is disposed. The ozone supply portion 300 has a process ozone transfer member and a thermal treatment ozone transfer member.

The process ozone transfer member is to transfer ozone to be used for the thin film deposition process, and the thermal treatment ozone transfer member is to transfer ozone to be used for the thermal treatment. The process ozone transfer member includes a process mass flow controller MFC1 disposed between two process valves 332 and 334, and the thermal treatment ozone transfer member includes a thermal treatment mass flow controller MFC2 disposed between two thermal treatment valves 336 and 338. (Page 3, lines 15–20). The process mass flow controller MFC1 controls an ozone flow in the thin film deposition process, and the thermal treatment mass flow controller MFC2 controls an ozone flow in the thermal treatment. (Page 4, lines 4–7). As shown in Figure 1, **the process mass flow controller MFC1 and the thermal treatment mass flow controller MFC2 are connected to a common ozone generator 310**.

Since the thermal treatment is performed prior to the thin film deposition process as a pre-process for easily depositing a thin film on a wafer, ozone is selectively allowed to flow the process mass flow controller MFC1 or the thermal treatment mass flow controller MFC2 by turning on/off the valves 332 and 336 of the process and thermal

treatment ozone transfer members. In other words, **only one of the process mass flow controller MFC1 and the thermal treatment mass flow controller MFC2 is operational at one time.** (Page 5, lines 13–15 and page 7, lines 28–29). In the thermal treatment, ozone flows at a first flow rate the thermal treatment mass flow controller to be provided to the reactor. Then, in the thin film deposition process, ozone flows at a second flow rate the process mass flow controller to be provided to the reactor. (Page 8, lines 8–10).

6. ISSUES

There are two issues on appeal:

(A) whether the Examiner's rejection of claims 1, 2, 6–10, 12–14, 17 and 18 under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al. is improper; and

(B) whether the Examiner's rejection of claims 11 and 19 under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Limb et al., Tanaka and Nozawa et al. and further in view of Nishikawa et al. is improper.

7. GROUPING OF CLAIMS

(A) For purpose of the first issue, claims 1, 2, 6–10, 12–14, 17 and 18 do not stand or fall together. The claims are grouped into two different groups as follows:

Group 1: Claims 1, 2, 6–10, 12–14 and 17 stand or fall together.

Group 2: Claim 18 stands alone.

(B) For purpose of the second issue, claims 11 and 19 stand or fall together.

8. ARGUMENT

A. Claims 1, 2, 6–10, 12–14, 17 and 18 are patentable under 35 U.S.C. §103(a) over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al.

It is respectfully submitted that claims 1, 2, 6–10, 12–14 and 17 (Group 1) stand or fall together as claim 1, the only independent claim in the group and the application, recites an apparatus of depositing a semiconductor thin film on a wafer. Claim 18 (Group

2) should stand alone as it is patentably distinct from claim 1, from which it indirectly depends, because it specifies first and third ozone transfer valves to control the ozone flows, none of which is recited in claim 1.

Group 1: Claims 1, 2, 6–10, 12–14 and 17

Claim 1 recites, *inter alia*, a first ozone transfer unit having a first mass flow controller to provide a first ozone flow at a first flow rate for a thin film deposition, and a second ozone transfer unit having a second mass flow controller to provide a second ozone flow at a second flow rate for a thermal treatment, wherein one of the first and second mass flow controllers provides one of the first and second ozone flows at a time. The Examiner acknowledges that Horie fails to teach this feature and relies on Limb et al. for teaching "two parallel flow passages through two mass flow controllers." The Examiner concludes that it would be obvious to connect two mass flow controllers in parallel to increase the range of flow measurement. Appellant respectfully disagrees with this analysis for the following reasons.

First, the combination of Horie, Limb et al., Tanaka and Nozawa et al. fails to teach the first and second mass flow controllers for providing the first and second ozone flows, respectively, such that "one of the first and second mass flow controllers provides one of the first and second ozone flows at a time," as claimed in claim 1. In his rejection, the Examiner references two gas sources 311 and 312 in Limb et al. as "two parallel flow passages through two mass flow controllers." In Limb et al., the gas sources and flow passages are not to provide ozone but to provide different gases, such as CO gas and CO_2, which are combined in a gas header. (Col. 2, lines 41–54). Furthermore, Limb et al. in combination with other cited references does not teach the first and second mass flow controllers "one of which provides one of the first and second ozone flows at a time," as claimed in claim 1.

It is well settled that for an obvious rejection to be proper, the references relied upon must teach all the claimed elements. See MPEP 2143.03 (To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested

by the prior art). Clearly, in this case, the prior art relied upon by the Examiner fails to teach the claimed elements. Thus, the rejection should be reversed.

Additionally, there is no motivation to combine the teachings of Horie and Limb et al. to arrive at the above feature of the claimed invention. For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made; as well as that all elements of the claimed invention are disclosed in the prior art; *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

With regard to the second element, there are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet,* 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obviousness was held improper.). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999). Furthermore, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

A statement that modifications of the prior art to meet the claimed invention would have been " 'well within the ordinary skill of the art at the time the claimed invention was made' " because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See also *In re Kotzab,* 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000).

As stated in previously filed amendments, the Horie invention is directed toward an apparatus for forming silicon oxide films on a wafer. In essence, Horie employs three separate gas passages for providing TEOS gas, nitrogen gas and oxygen-based gas, respectively, to a reactor. In Horie, the oxygen-based gas is provided to a chamber merely to accelerate oxidation of TEOS gas that is deposited in an exhaust vacuum pipe without reacting, so as to reduce the amount of particles being deposited on a wafer. (Col. 6, lines 9–16). However, this is wholly unrelated to the present invention, which relates to providing two different ozone flows through two separate flow controllers, respectively, such that one of the two ozone flows through one of the flow controllers at a time. Therefore, one skilled in the art would hardly be motivated to combine the teachings of the cited references with the structure of Horie to arrive at the Appellant's claims.

On page 2 of the final Office action of June 9, 2003, the Examiner simply states that Limb et al. disclose "two parallel flow passages through two mass flow controllers" and that it would be obvious to connect two mass flow controllers in parallel to "increase the range of flow measurement." This statement does not rebut the Appellant's contention that there is no suggestion in the art itself for combining the teachings of Horie and Limb et al. It is submitted that Horie and Limb et al. in fact have the substantially same structure and function such that three different gases are provided to a reactor through three separate passages, respectively. Neither Horie nor Limb et al. teaches or suggests the two different ozone flows that are provided through the two separate passages each at a time, as claimed in claim 1. Furthermore, the two mass flow controllers in the present invention are not to "increase the range of flow measurement" but to control the different flows of ozone in the two separate passages. Thus, the Examiner's reasoning in his obviousness rejection falls short of establishing a *prima facie* case of obviousness, since no motivation for combination is established.

Therefore, for the reasons outlined above, claim 1 and its dependent claims 2, 6–10, 12–14 and 17 are patentable over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al., and it is respectfully requested that the rejections in that regard be reversed.

Group 2: Claim 18

Claim 18 stands or falls alone from claims 1, 2, 6–10, 12–14 and 17 (Group 1) because claim 18 recites two "ozone transfer valves" connected to the two mass flow controllers, respectively, to control the ozone flow such that the two valves are "selectively" opened so that the ozone is provided through "one" of the two ozone transfer units, which are not found in the claims of Group 1.

As mentioned above for Group 1, the combination of Horie, Limb et al., Tanaka and Nozawa et al. fails to teach two mass flow controllers for providing two different ozone flows such that one of the two mass flow controllers provides one of the two ozone flows at a time. Furthermore, none of the cited references, either alone or in combination, teaches or suggests two ozone transfer valves connected to two mass flow controllers, respectively, to be selectively opened so that ozone is provided through one of the mass flow controllers.

Additionally, as stated above, there is a lack of a *prima facie* establishment of obviousness as to claim 1. Since a combination of the Horie and Limb et al. references also forms, in part, the basis of the §103 rejection of claim 18, this rejection should be reversed for the same reasons.

Therefore, for the reasons outlined above, claim 18 is patentable over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al.

B. Claims 11 and 19 are patentable under 35 U.S.C. §103(a) over Horie in view of Limb et al., Tanaka and Nozawa et al. and further in view of Nishikawa et al.

As stated above for Group 1, the combination of Horie, Limb et al., Tanaka and Nozawa et al. fails to teach two mass flow controllers for providing two different ozone flows such that one of the two mass flow controllers provides one of the two ozone flows at a time, as claimed in claim 1.

Nishikawa et al. merely discloses an apparatus for supplying a mixture of different gases to a plurality of semiconductor manufacturing units. (Col. 2, lines 15–29 and col. 3, lines 62–67). Nishikawa et al. neither discloses nor suggests the above mentioned feature of claim 1. Thus, it is respectfully submitted that Horie, Limb et al.,

Tanaka, Nozawa et al. and Nishikawa et al., either alone or in combination, do not teach or suggest the subject matter claimed in claim 1.

Claims 11 and 19 depend from claim 1, thus include all the limitations of claim 1. It is thus noted that should claim 1 be found allowable, claims 11 and 19 should also be found allowable.

Additionally, as stated above, there is lack of a *prima facie* establishment of obviousness as to claim 1, from which claims 11 and 19 depend. Since a combination of the Horie and Limb et al. references also forms, in part, the basis of the §103 rejection of claims 11 and 19, this rejection should be reversed for the same reasons.

Therefore, for the reasons outlined above, claims 11 and 19 are patentable over Horie in view of Limb et al., Tanaka and Nozawa et al. and further in view of Nishikawa et al., and it is respectfully requested that the rejections in that regard be reversed.

C. Conclusion

For the above stated reasons, it is respectfully requested that the rejections of claims 1, 2, 6–14 and 17–19, under each of the grounds outlined in the final Office action of June 9, 2003, be reversed. If any fees are due with respect to this Appeal, please charge them to Deposit Account No. 06-1130 maintained by appellant's attorneys.

Respectfully submitted,

CANTOR COLBURN LLP

By _____

David A. Fox
Reg. No. 38, 807
Confirmation No. 2126
Cantor Colburn LLP
55 Griffin Road South
Bloomfield, CT 06002
PTO Customer No. 23413
Telephone: (860) 286-2929
Fax: (860) 286-0115

Date: December 9, 2003

APPENDIX

1. A semiconductor thin film deposition apparatus comprising:

a reactor in which a wafer is received;

a reaction gas supply unit for providing reaction gas to the reactor;

an inert gas supply unit for providing inert gas to the reactor;

an exhaust pump for exhausting gas from the reactor;

an ozone generator for generating ozone to react with the reaction gas;

a first ozone transfer unit having a first mass flow controller connected to the ozone generator, for receiving the ozone from the ozone generator to provide the reactor with a first ozone flow at a first flow rate for a thin film deposition on the wafer, wherein the first ozone flow and the reaction gas are provided into the reactor at respective times different from each other;

a second ozone transfer unit having a second mass flow controller connected to the ozone generator, for receiving the ozone from the ozone generator to provide the reactor with a second ozone flow at a second flow rate for a thermal treatment on the wafer, the first and second mass flow controllers being connected parallel to each other between the ozone generator and the reactor, wherein one of the first and second mass flow controllers provides corresponding one of the first and second ozone flows to the reactor at a time;

an ozone control unit connected to the ozone generator in parallel with the first and second ozone transfer units, for receiving the ozone from the ozone generator to allow a certain amount of ozone to flow to the first and second ozone transfer units by removing an excessive amount of ozone generated by the ozone generator;

a first selection valve connected between the first and second ozone transfer units and the reactor, for controlling the first or second ozone flow from the first or second ozone transfer unit to the reactor; and

a second selection valve connected between the first and second ozone transfer units and the exhaust pump, for controlling the first or second ozone flow from the first or second ozone transfer unit to the exhaust pump, wherein the first and second selection valves perform opposite operations at a same time.

2. The semiconductor thin film deposition apparatus of claim 1, further comprising a main valve disposed between the ozone generator and the first and second ozone transfer units, for controlling a flow of the ozone from the ozone generator to the first and second ozone transfer units.

6. The semiconductor thin film deposition apparatus of claim 2, wherein the first ozone transfer unit further comprises:

a first ozone transfer valve having an inlet connected to an outlet of the main valve of which inlet is connected to an outlet of the ozone generator, and an outlet connected to an inlet of the first mass flow controller; and

a second ozone transfer valve having an inlet connected to an outlet of the first mass flow controller and an outlet generating the first ozone flow to the first and second selection valves.

7. The semiconductor thin film deposition apparatus of claim 6, wherein the second ozone transfer unit further comprises:

a third ozone transfer valve having an inlet connected to the outlet of the main valve to which the inlet of the first ozone transfer valve is connected, and an outlet connected to an inlet of the second mass flow controller; and

a fourth ozone transfer valve having an inlet connected to an outlet of the second mass flow controller and an outlet generating the first ozone flow to the first and second selection valves.

8. The semiconductor thin film deposition apparatus of claim 1, wherein the first flow rate of the first ozone flow is in a range from about 100 sccm to about 500 sccm.

9. The semiconductor thin film deposition apparatus of claim 8, wherein the second flow rate of the second ozone flow is in a range from about 100 sccm to about 20000 sccm.

10. The semiconductor thin film deposition apparatus of claim 7, wherein the ozone control unit comprises;

an automatic pressure valve connected to the ozone generator in parallel with the main valve, for being automatically opened to receive the ozone from the ozone generator when pressure of the ozone generated from the ozone generator is equal to or greater than a predetermined value; and

an ozone remover for receiving and removing ozone which has passed through the automatic pressure valve.

11. The semiconductor thin film deposition apparatus of claim 10, wherein the ozone control unit further comprises a check valve connected between the main valve and the ozone remover, for allowing the ozone passing through the automatic pressure valve to flow only toward the ozone remover when pressure of the ozone generated from the ozone generator is equal to or greater than the predetermined value.

12. The semiconductor thin film deposition apparatus of claim 7, further comprising a heater for providing heat to perform the thermal treatment on the wafer in the reactor.

13. The semiconductor thin film deposition apparatus of claim 12, wherein the heat has a temperature in a range from about 300 °C to about 700 °C.

14. The semiconductor thin film deposition apparatus of claim 1, wherein the inert gas is argon.

17. The semiconductor thin film deposition apparatus of claim 7, wherein the first selection valve has an inlet connected to both the outlets of the second and fourth ozone transfer valves and an outlet connected to an inlet of the reactor, and the second selection valve has an inlet connected to both the outlets of the second and fourth ozone transfer valves and an outlet connected to the exhaust pump.

18. The semiconductor thin film deposition apparatus of claim 7, wherein the first ozone transfer valve and the third ozone transfer valve are controlled to be selectively opened so that the ozone from the main valve is provided to the reactor through one of the first and second ozone transfer units.

19. The semiconductor thin film deposition apparatus of claim 11, wherein the automatic pressure valve has an inlet connected to the outlet of the ozone generator and an inlet of the main valve, the ozone remover has an inlet connected to an outlet of the automatic pressure valve, and the check valve is connected between the outlet of the main valve and the inlet of the ozone remover.

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APPEAL BRIEF

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3. STATUS OF CLAIMS

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The final rejection of claims 1, 2, 6–14 and 17–19 is appealed.

4. STATUS OF AMENDMENTS

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5. SUMMARY OF INVENTION

The following is a concise explanation of the invention. Reference to the specification and drawings is made pursuant to 37 CFR 1.192 and is not intended to limit the claims to the embodiments shown and described in the application.

The invention relates to an apparatus of performing a thin film deposition process and a thermal treatment on a wafer using ozone. (Page 3, lines 2–8). The apparatus includes a gas supply portion 400 and an ozone supply portion 300 for providing reaction gas and ozone, respectively, to a reactor 100 in which a wafer is disposed. The ozone supply portion 300 has a process ozone transfer member and a thermal treatment ozone transfer member.

The process ozone transfer member is to transfer ozone to be used for the thin film deposition process, and the thermal treatment ozone transfer member is to transfer ozone to be used for the thermal treatment. The process ozone transfer member includes a process mass flow controller MFC1 disposed between two process valves 332 and 334, and the thermal treatment ozone transfer member includes a thermal treatment mass flow controller MFC2 disposed between two thermal treatment valves 336 and 338. (Page 3, lines 15–20). The process mass flow controller MFC1 controls an ozone flow in the thin film deposition process, and the thermal treatment mass flow controller MFC2 controls an ozone flow in the thermal treatment. (Page 4, lines 4–7). As shown in Figure 1, **the process mass flow controller MFC1 and the thermal treatment mass flow controller MFC2 are connected to a common ozone generator 310**.

Since the thermal treatment is performed prior to the thin film deposition process as a pre-process for easily depositing a thin film on a wafer, ozone is selectively allowed to flow the process mass flow controller MFC1 or the thermal treatment mass flow controller MFC2 by turning on/off the valves 332 and 336 of the process and thermal

treatment ozone transfer members. In other words, **only one of the process mass flow controller MFC1 and the thermal treatment mass flow controller MFC2 is operational at one time.** (Page 5, lines 13–15 and page 7, lines 28–29). In the thermal treatment, ozone flows at a first flow rate the thermal treatment mass flow controller to be provided to the reactor. Then, in the thin film deposition process, ozone flows at a second flow rate the process mass flow controller to be provided to the reactor. (Page 8, lines 8–10).

6. ISSUES

There are two issues on appeal:

(A) whether the Examiner's rejection of claims 1, 2, 6–10, 12–14, 17 and 18 under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al. is improper; and

(B) whether the Examiner's rejection of claims 11 and 19 under 35 U.S.C. §103(a) as being unpatentable over Horie in view of Limb et al., Tanaka and Nozawa et al. and further in view of Nishikawa et al. is improper.

7. GROUPING OF CLAIMS

(A) For purpose of the first issue, claims 1, 2, 6–10, 12–14, 17 and 18 do not stand or fall together. The claims are grouped into two different groups as follows:

Group 1: Claims 1, 2, 6–10, 12–14 and 17 stand or fall together.

Group 2: Claim 18 stands alone.

(B) For purpose of the second issue, claims 11 and 19 stand or fall together.

8. ARGUMENT

A. Claims 1, 2, 6–10, 12–14, 17 and 18 are patentable under 35 U.S.C. §103(a) over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al.

It is respectfully submitted that claims 1, 2, 6–10, 12–14 and 17 (Group 1) stand or fall together as claim 1, the only independent claim in the group and the application, recites an apparatus of depositing a semiconductor thin film on a wafer. Claim 18 (Group

2) should stand alone as it is patentably distinct from claim 1, from which it indirectly depends, because it specifies first and third ozone transfer valves to control the ozone flows, none of which is recited in claim 1.

Group 1: Claims 1, 2, 6–10, 12–14 and 17

Claim 1 recites, *inter alia*, a first ozone transfer unit having a first mass flow controller to provide a first ozone flow at a first flow rate for a thin film deposition, and a second ozone transfer unit having a second mass flow controller to provide a second ozone flow at a second flow rate for a thermal treatment, wherein one of the first and second mass flow controllers provides one of the first and second ozone flows at a time. The Examiner acknowledges that Horie fails to teach this feature and relies on Limb et al. for teaching "two parallel flow passages through two mass flow controllers." The Examiner concludes that it would be obvious to connect two mass flow controllers in parallel to increase the range of flow measurement. Appellant respectfully disagrees with this analysis for the following reasons.

First, the combination of Horie, Limb et al., Tanaka and Nozawa et al. fails to teach the first and second mass flow controllers for providing the first and second ozone flows, respectively, such that "one of the first and second mass flow controllers provides one of the first and second ozone flows at a time," as claimed in claim 1. In his rejection, the Examiner references two gas sources 311 and 312 in Limb et al. as "two parallel flow passages through two mass flow controllers." In Limb et al., the gas sources and flow passages are not to provide ozone but to provide different gases, such as CO gas and CO_2, which are combined in a gas header. (Col. 2, lines 41–54). Furthermore, Limb et al. in combination with other cited references does not teach the first and second mass flow controllers "one of which provides one of the first and second ozone flows at a time," as claimed in claim 1.

It is well settled that for an obvious rejection to be proper, the references relied upon must teach all the claimed elements. See MPEP 2143.03 (To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested

by the prior art). Clearly, in this case, the prior art relied upon by the Examiner fails to teach the claimed elements. Thus, the rejection should be reversed.

Additionally, there is no motivation to combine the teachings of Horie and Limb et al. to arrive at the above feature of the claimed invention. For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made; as well as that all elements of the claimed invention are disclosed in the prior art; *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

With regard to the second element, there are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet,* 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obviousness was held improper.). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999). Furthermore, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

A statement that modifications of the prior art to meet the claimed invention would have been " 'well within the ordinary skill of the art at the time the claimed invention was made' " because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See also *In re Kotzab,* 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000).

As stated in previously filed amendments, the Horie invention is directed toward an apparatus for forming silicon oxide films on a wafer. In essence, Horie employs three separate gas passages for providing TEOS gas, nitrogen gas and oxygen-based gas, respectively, to a reactor. In Horie, the oxygen-based gas is provided to a chamber merely to accelerate oxidation of TEOS gas that is deposited in an exhaust vacuum pipe without reacting, so as to reduce the amount of particles being deposited on a wafer. (Col. 6, lines 9–16). However, this is wholly unrelated to the present invention, which relates to providing two different ozone flows through two separate flow controllers, respectively, such that one of the two ozone flows through one of the flow controllers at a time. Therefore, one skilled in the art would hardly be motivated to combine the teachings of the cited references with the structure of Horie to arrive at the Appellant's claims.

On page 2 of the final Office action of June 9, 2003, the Examiner simply states that Limb et al. disclose "two parallel flow passages through two mass flow controllers" and that it would be obvious to connect two mass flow controllers in parallel to "increase the range of flow measurement." This statement does not rebut the Appellant's contention that there is no suggestion in the art itself for combining the teachings of Horie and Limb et al. It is submitted that Horie and Limb et al. in fact have the substantially same structure and function such that three different gases are provided to a reactor through three separate passages, respectively. Neither Horie nor Limb et al. teaches or suggests the two different ozone flows that are provided through the two separate passages each at a time, as claimed in claim 1. Furthermore, the two mass flow controllers in the present invention are not to "increase the range of flow measurement" but to control the different flows of ozone in the two separate passages. Thus, the Examiner's reasoning in his obviousness rejection falls short of establishing a *prima facie* case of obviousness, since no motivation for combination is established.

Therefore, for the reasons outlined above, claim 1 and its dependent claims 2, 6–10, 12–14 and 17 are patentable over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al., and it is respectfully requested that the rejections in that regard be reversed.

Group 2: Claim 18

Claim 18 stands or falls alone from claims 1, 2, 6–10, 12–14 and 17 (Group 1) because claim 18 recites two "ozone transfer valves" connected to the two mass flow controllers, respectively, to control the ozone flow such that the two valves are "selectively" opened so that the ozone is provided through "one" of the two ozone transfer units, which are not found in the claims of Group 1.

As mentioned above for Group 1, the combination of Horie, Limb et al., Tanaka and Nozawa et al. fails to teach two mass flow controllers for providing two different ozone flows such that one of the two mass flow controllers provides one of the two ozone flows at a time. Furthermore, none of the cited references, either alone or in combination, teaches or suggests two ozone transfer valves connected to two mass flow controllers, respectively, to be selectively opened so that ozone is provided through one of the mass flow controllers.

Additionally, as stated above, there is a lack of a *prima facie* establishment of obviousness as to claim 1. Since a combination of the Horie and Limb et al. references also forms, in part, the basis of the §103 rejection of claim 18, this rejection should be reversed for the same reasons.

Therefore, for the reasons outlined above, claim 18 is patentable over Horie in view of Limb et al. and further in view of Tanaka and Nozawa et al.

B. Claims 11 and 19 are patentable under 35 U.S.C. §103(a) over Horie in view of Limb et al., Tanaka and Nozawa et al. and further in view of Nishikawa et al.

As stated above for Group 1, the combination of Horie, Limb et al., Tanaka and Nozawa et al. fails to teach two mass flow controllers for providing two different ozone flows such that one of the two mass flow controllers provides one of the two ozone flows at a time, as claimed in claim 1.

Nishikawa et al. merely discloses an apparatus for supplying a mixture of different gases to a plurality of semiconductor manufacturing units. (Col. 2, lines 15–29 and col. 3, lines 62–67). Nishikawa et al. neither discloses nor suggests the above mentioned feature of claim 1. Thus, it is respectfully submitted that Horie, Limb et al.,

Tanaka, Nozawa et al. and Nishikawa et al., either alone or in combination, do not teach or suggest the subject matter claimed in claim 1.

Claims 11 and 19 depend from claim 1, thus include all the limitations of claim 1. It is thus noted that should claim 1 be found allowable, claims 11 and 19 should also be found allowable.

Additionally, as stated above, there is lack of a *prima facie* establishment of obviousness as to claim 1, from which claims 11 and 19 depend. Since a combination of the Horie and Limb et al. references also forms, in part, the basis of the §103 rejection of claims 11 and 19, this rejection should be reversed for the same reasons.

Therefore, for the reasons outlined above, claims 11 and 19 are patentable over Horie in view of Limb et al., Tanaka and Nozawa et al. and further in view of Nishikawa et al., and it is respectfully requested that the rejections in that regard be reversed.

C. Conclusion

For the above stated reasons, it is respectfully requested that the rejections of claims 1, 2, 6–14 and 17–19, under each of the grounds outlined in the final Office action of June 9, 2003, be reversed. If any fees are due with respect to this Appeal, please charge them to Deposit Account No. 06-1130 maintained by appellant's attorneys.

Respectfully submitted,

CANTOR COLBURN LLP

By _____

David A. Fox
Reg. No. 38, 807
Confirmation No. 2126
Cantor Colburn LLP
55 Griffin Road South
Bloomfield, CT 06002
PTO Customer No. 23413
Telephone: (860) 286-2929
Fax: (860) 286-0115

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APPENDIX

1. A semiconductor thin film deposition apparatus comprising:

a reactor in which a wafer is received;

a reaction gas supply unit for providing reaction gas to the reactor;

an inert gas supply unit for providing inert gas to the reactor;

an exhaust pump for exhausting gas from the reactor;

an ozone generator for generating ozone to react with the reaction gas;

a first ozone transfer unit having a first mass flow controller connected to the ozone generator, for receiving the ozone from the ozone generator to provide the reactor with a first ozone flow at a first flow rate for a thin film deposition on the wafer, wherein the first ozone flow and the reaction gas are provided into the reactor at respective times different from each other;

a second ozone transfer unit having a second mass flow controller connected to the ozone generator, for receiving the ozone from the ozone generator to provide the reactor with a second ozone flow at a second flow rate for a thermal treatment on the wafer, the first and second mass flow controllers being connected parallel to each other between the ozone generator and the reactor, wherein one of the first and second mass flow controllers provides corresponding one of the first and second ozone flows to the reactor at a time;

an ozone control unit connected to the ozone generator in parallel with the first and second ozone transfer units, for receiving the ozone from the ozone generator to allow a certain amount of ozone to flow to the first and second ozone transfer units by removing an excessive amount of ozone generated by the ozone generator;

a first selection valve connected between the first and second ozone transfer units and the reactor, for controlling the first or second ozone flow from the first or second ozone transfer unit to the reactor; and

a second selection valve connected between the first and second ozone transfer units and the exhaust pump, for controlling the first or second ozone flow from the first or second ozone transfer unit to the exhaust pump, wherein the first and second selection valves perform opposite operations at a same time.

2. The semiconductor thin film deposition apparatus of claim 1, further comprising a main valve disposed between the ozone generator and the first and second ozone transfer units, for controlling a flow of the ozone from the ozone generator to the first and second ozone transfer units.

6. The semiconductor thin film deposition apparatus of claim 2, wherein the first ozone transfer unit further comprises:

a first ozone transfer valve having an inlet connected to an outlet of the main valve of which inlet is connected to an outlet of the ozone generator, and an outlet connected to an inlet of the first mass flow controller; and

a second ozone transfer valve having an inlet connected to an outlet of the first mass flow controller and an outlet generating the first ozone flow to the first and second selection valves.

7. The semiconductor thin film deposition apparatus of claim 6, wherein the second ozone transfer unit further comprises:

a third ozone transfer valve having an inlet connected to the outlet of the main valve to which the inlet of the first ozone transfer valve is connected, and an outlet connected to an inlet of the second mass flow controller; and

a fourth ozone transfer valve having an inlet connected to an outlet of the second mass flow controller and an outlet generating the first ozone flow to the first and second selection valves.

8. The semiconductor thin film deposition apparatus of claim 1, wherein the first flow rate of the first ozone flow is in a range from about 100 sccm to about 500 sccm.

9. The semiconductor thin film deposition apparatus of claim 8, wherein the second flow rate of the second ozone flow is in a range from about 100 sccm to about 20000 sccm.

10. The semiconductor thin film deposition apparatus of claim 7, wherein the ozone control unit comprises;

an automatic pressure valve connected to the ozone generator in parallel with the main valve, for being automatically opened to receive the ozone from the ozone generator when pressure of the ozone generated from the ozone generator is equal to or greater than a predetermined value; and

an ozone remover for receiving and removing ozone which has passed through the automatic pressure valve.

11. The semiconductor thin film deposition apparatus of claim 10, wherein the ozone control unit further comprises a check valve connected between the main valve and the ozone remover, for allowing the ozone passing through the automatic pressure valve to flow only toward the ozone remover when pressure of the ozone generated from the ozone generator is equal to or greater than the predetermined value.

12. The semiconductor thin film deposition apparatus of claim 7, further comprising a heater for providing heat to perform the thermal treatment on the wafer in the reactor.

13. The semiconductor thin film deposition apparatus of claim 12, wherein the heat has a temperature in a range from about 300 °C to about 700 °C.

14. The semiconductor thin film deposition apparatus of claim 1, wherein the inert gas is argon.

17. The semiconductor thin film deposition apparatus of claim 7, wherein the first selection valve has an inlet connected to both the outlets of the second and fourth ozone transfer valves and an outlet connected to an inlet of the reactor, and the second selection valve has an inlet connected to both the outlets of the second and fourth ozone transfer valves and an outlet connected to the exhaust pump.

18. The semiconductor thin film deposition apparatus of claim 7, wherein the first ozone transfer valve and the third ozone transfer valve are controlled to be selectively opened so that the ozone from the main valve is provided to the reactor through one of the first and second ozone transfer units.

19. The semiconductor thin film deposition apparatus of claim 11, wherein the automatic pressure valve has an inlet connected to the outlet of the ozone generator and an inlet of the main valve, the ozone remover has an inlet connected to an outlet of the automatic pressure valve, and the check valve is connected between the outlet of the main valve and the inlet of the ozone remover.